

WHAT IS CLAIMED IS:

1. An actuation assembly for moving in unison a plurality of aerodynamic vanes disposed within a variable geometry turbocharger that includes
5 an actuator coupled to a movable unison ring disposed within a turbocharger turbine housing and attached to the plurality of aerodynamic vanes, the actuation assembly comprising a crank arm rotatably disposed within the turbine housing and attached at a first end to the actuator and to a second end to the unison ring, wherein the crank arm second end includes a first gear member comprising a number of teeth, and the
10 unison ring includes a second gear member comprising a number of teeth, and wherein the teeth of the first and second gear members are cooperatively engaged with one another.
2. The actuation assembly as recited in claim 1 wherein the second gear
15 assembly is movably coupled to the unison ring to permit a predetermined degree of unison ring thermal expansion and contraction movement during turbocharger operation while maintaining a desired distance between the first and second gear members.
- 20 3. The actuation assembly as recited in claim 1 wherein the first gear member is a pinion gear and the second gear member is a rack gear.
4. The actuation assembly as recited in claim 3 wherein the rack gear and unison ring are coupled to one another by cooperative surface features.
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5. The actuation assembly as recited in claim 4 wherein the cooperative surface features comprise a tongue that cooperates within an opening, and wherein the tongue and opening are sized to permit a desired degree of movement between the unison ring and rack gear.

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6. The actuation assembly as recited in claim 5 wherein the tongue projects outwardly from the unison ring, and the opening is disposed within a surface of the rack gear..

5 7. A turbocharger assembly comprising:
a turbine housing;
a turbine wheel carried within the turbine housing and attached to a shaft;
a plurality of vanes pivotably disposed within the turbine housing;
a unison ring attached to the plurality of vanes to move the vanes in unison
10 with one another, the unison ring including a first gear member having a number of teeth attached thereto; and
a crank arm disposed within the turbine for moving the unison ring, the crank arm including a second gear member at one of its ends having a number of teeth that are engaged with the teeth of the first gear member.

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8. The turbocharger assembly as recited in claim 7 wherein the first gear member is a rack gear and the second gear member is a pinion gear.

9. The turbocharger assembly as recited in claim 8 further comprising
20 means for maintaining a predetermined tolerance between the rack gear and the pinion gear during operation of the turbocharger.

10. The turbocharger assembly as recited in claim 9 wherein the means for maintaining comprises a cooperative attachment between the rack gear and the
25 unison ring.

11. The turbocharger assembly as recited in claim 9 wherein the cooperative attachment comprises a tongue that projects from one of the unison ring and rack gear, into an opening of the other of the unison ring and rack gear.

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12. A turbocharger assembly comprising:

a turbine housing;

a turbine wheel carried within the turbine housing and attached to a shaft;

a plurality of vanes pivotably disposed within the turbine housing;

5 a unison ring attached to the plurality of vanes to move the vanes in unison with one another, the unison ring including a rack gear having a number of teeth attached thereto;

a crank arm disposed within the turbine for affecting movement of the unison ring, the crank arm including a pinion gear at one of its ends that has a number of teeth that are engaged with the teeth of the rack gear;

10 wherein the gear rack is movably attached to the unison ring to permit a predetermined degree of unison ring thermal movement during turbocharger operation while maintaining a desired tolerance between the pinion gear and rack gear.

15 13. A method for actuating a plurality of movable aerodynamic vanes within a variable geometry turbocharger, the method comprising the step of rotating a crank arm that is disposed within a turbine housing of the turbocharger, the crank arm having a first gear member attached at one of its ends that is engaged with a second gear member attached to a unison ring disposed within the turbocharger,
20 wherein the step of rotating the crank arm causes the unison ring to be rotated by the engagement of the first and second gear members, and wherein the unison ring is coupled to the plurality of aerodynamic vanes to move the vanes in unison.